REVIEWS OF BOOKS

Surface Formations and Agricultural Conditions of Northeastern Minnesota (Minnesota Geological Survey, *Bulletins,* no. 13). By FRANK LEVERETT and FREDERICK W. SARDESON. With a chapter on Climatic Conditions of Minnesota by U. G. PURSSELL. (Minneapolis, The University of Minnesota, 1917. vi, 72 p. Maps, plates, diagrams)

This bulletin is the second part of a report produced by the coöperation of the Minnesota and United States geological surveys, of which the first part, on the northwest quarter of the state, published two years ago, was reviewed in the May, 1915, number of the MINNESOTA HISTORY BULLETIN (1:59–61). Another part, treating of the south half of Minnesota and completing this work, is expected soon to be issued.

Professor William H. Emmons, director of the Minnesota survey, contributes a short introduction. Chapter 1, on the physical features of the state, has three full-page maps. The first shows the altitude above the sea by the contour lines of one thousand, fifteen hundred, and two thousand feet. The second outlines the diverse drift sheets, the loess of southeastern Minnesota, and the glacial Lakes Agassiz and Duluth. The third shows the areas of forest and prairie; it needs, however, a correction to outline a considerably wider tract of the predominantly prairie region east of the Red River, placing therein nearly all of Mahnomen, Polk, Red Lake, Pennington, Marshall, and Roseau counties.

Three glacial lakes, held by barriers of the departing ice sheet, are described and partly delineated by this report and its maps: Lake Agassiz, in the drainage area of the Red River and Lake Winnipeg, named by the present writer in 1879; Lake Duluth, in the Lake Superior basin, first named by me in 1894 as the Western Superior glacial lake, but soon renamed Lake Duluth by Taylor; and Lake Upham, named by the late Professor N. H. Winchell in 1901, occupying an area of about 1,250 square miles of the St. Louis River basin, with outlet across the Savanna

portage to Sandy Lake and the upper Mississippi. On the international boundary Lake Agassiz reached east to Lac La Croix and the western end of Hunters Island, on a meridian somewhat east of the east end of Vermilion Lake. Above the city of Duluth one of the upper shore lines of the glacial Lake Duluth is marked by the massive beach of gravel and sand which is followed by the boulevard, 470 to 475 feet above Lake Superior. For a fourth and nearly contemporaneous ancient lake, of about five hundred square miles in area as here mapped, named Lake Aitkin by my report on Aitkin County in 1899, having a well-defined beach in and adjoining the town of this name, further field work seems desirable to demonstrate its relationship to the waning and lobate ice sheet, since it may be explainable, as the present report suggests, by being held in a temporary drift basin, and being later drained away when the Mississippi River eroded a deeper channel in the morainal drift below this lake.

On the folded map of northeastern Minnesota, which accompanies this report, showing in much detail the surface formations, large areas, mainly occupied by outcropping rocks, are mapped from Rainy Lake eastward, adjoining the international boundary and including the two great tracts, of very irregular outlines, which have been designated as the Superior National Forest. A narrower belt of predominant rock outcrops is also mapped, though with some interruptions, at a little distance back from the north shore of Lake Superior along all its extent in Minnesota, from Fond du Lac and Duluth to Pigeon Point. Another such rock belt forms the Mesabi Range, from near Hibbing and Chisholm east and northeastward for fifty miles. For these tracts of rock at or near the surface the map gives this descriptive note: "The rock is exposed or scantily covered by drift, but among the rock knobs are depressions and plains in which forests flourish. Of low grade for agriculture and largely uncultivated."

Chapter 2 is a reprint from the preceding publication on northwestern Minnesota, being a very valuable summary of the climatic conditions of the whole state, contributed by the director of the Minnesota section of the United States Weather Bureau. It has nine full-page maps and ten tables, giving the mean yearly and monthly records, from many years of observations, of tem-

perature, rainfall, and snowfall, and the prevailing directions and average velocity of winds.

The third and final chapter comprises a general statement of the surface geology of northeastern Minnesota and detailed descriptions of each of its counties, namely, Cook, Lake, St. Louis, Koochiching, Itasca, Aitkin, and Carlton, with parts of Cass and Crow Wing. Three drift sheets are discriminated and bear the names given by Tyrrell to three great fields of outflow of the continental glacier: the Keewatin drift, deposited by a vast ice field moving from the northwest over the greater part of this state; the Labradorian drift, spread by a similar ice field flowing from northeastern Canada across the basin of Lake Superior, and the Patrician drift, borne southward by an earlier glacial outflow from a central region of snowfall and deep ice accumulation on the highlands north of Lake Superior and on the area of the new district of Patricia, named in honor of the English princess, on the southwest side of Hudson and James bays.

Minnesota is fortunate in having for this work the service of Mr. Leverett, who, during more than thirty years, has been a specialist of the United States Geological Survey for field work and investigations in surface and glacial geology. Very important also is the aid by Professor Sardeson, former member of the faculty of the University of Minnesota, engaged through many years in researches on the geology and paleontology of the state, and more recently an expert on the drainage and reclamation of its marsh and swamp lands and peat bogs.

Besides the marvelous mines of iron ore along the Vermilion, Mesabi, and Cuyuna ranges, within the northeast part of Minnesota described by this report, its next most noteworthy economic feature consists in its large rocky areas adapted principally for scientific planting and cultivation of forests. But other large tracts are well adapted for agriculture, especially for market gardening to supply vegetables, hardy fruits and berries, and also dairy products, all sure of ready demand in Duluth, St. Paul, and Minneapolis.

The detailed map of this part of the state has contour lines, showing topographic configuration and altitude above the sea, though such lines were not given on the preceding map of northwestern Minnesota. For the south half of the state we may hope

that not only contour lines will be shown, but also the altitudes of many lakes and railway stations, their heights in feet above the sea being printed on the map for convenient reference and comparison. Moreover, a needed detail for this northeastern map remains to be provided, which also was not attempted by the maps of the *Final Report* of the Minnesota Geological Survey: contour lines drawn near together vertically, with intervals of only fifty feet, upon all of Lake and Cook counties. Thus the Sawteeth Mountains, near the lake shore in Cook County between Temperance and Cascade rivers, would be clearly represented, as they are so well seen from all passing steamers or sailing vessels. The map could also show, by insertion of figures, that the shore of Lake Superior, which is the lowest land in Minnesota, is 602 feet above the sea, and that the Misquah hills, near Winchell Lake in the central part of Cook County, the highest points in the state, are about 2,230 feet above the sea.

WARREN UPHAM

Holmes Anniversary Volume: Anthropological Essays Presented to William Henry Holmes in Honor of His Seventieth Birthday, December 1, 1916, by His Friends and Colaborers. (Washington, 1916. vii, 499 p. Portrait, plates, text figures)

This quarto volume of forty-four essays, illustrated by 135 plates as well as by many figures in the text, presents a grand array of observations and studies in themes of great interest to anthropologists, chiefly relating to localities and peoples in the United States, Mexico, and Central America. Two of these papers are reports of special investigations in Minnesota: "Anthropology of the Chippewa" (pages 198–227), by Aleš Hrdlička of the United States National Museum, Washington, and "Ethnic Amalgamation" (pages 228–240), by Professor Albert E. Jenks of the University of Minnesota.

On account of fraudulent acquisition of lands and timber by lumber companies and land speculators from mixed-blood Chippewa (Ojibways) of the White Earth Reservation in Minnesota, following the passage by Congress in 1906–07 of acts providing for individual allotments of tribal lands and permitting mixed-